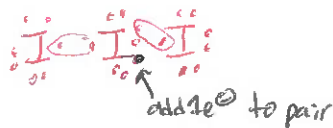
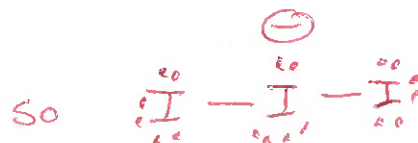
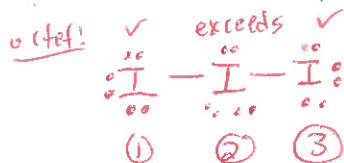


Chapter 8 – Resonance and Formal Charge Practice Problems

1. Draw the most plausible Lewis dot structure of
- I_3^-
- . Calculate the formal charge on each I.

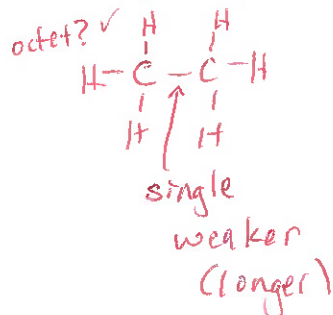
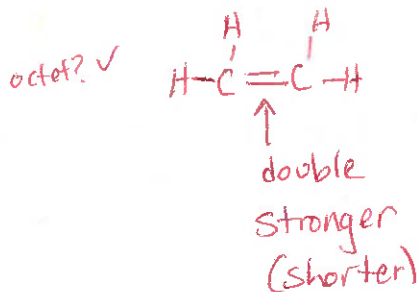
add $1e^-$

$$F.C. = \# V.E. - \frac{1}{2}(\# \text{ bonding } e^-) - \# \text{ non-bonding } e^-$$



	I #1	I #2	I #3
valence e ⁻ s	7	7	7
- bonding e ⁻ s	$\frac{1}{2}(2) = 1$	$\frac{1}{2}(4) = 2$	$\frac{1}{2}(2) = 1$
- non-bonding e ⁻ s	6	6	6
Formal charge	0	-1	0

2. Draw the Lewis dot structures of ethylene (
- H_2CCH_2
-) and ethane (
- H_3CCH_3
-). What is the bond order (single, double, triple, quadruple) between the carbons? Would you predict a stronger or weaker bond for ethylene versus ethane?

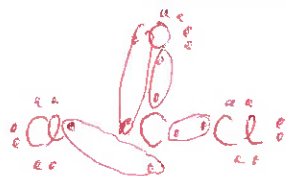


	C
v	4
-B	$\frac{1}{2}(2)$
-NB	0
FC	0

Are there any plausible resonance structures for either? **No!** bl can't move atoms
What is the formal charge on C? **0**

Trick! *need to maintain at least a single bond b/w atoms when drawing resonance structures

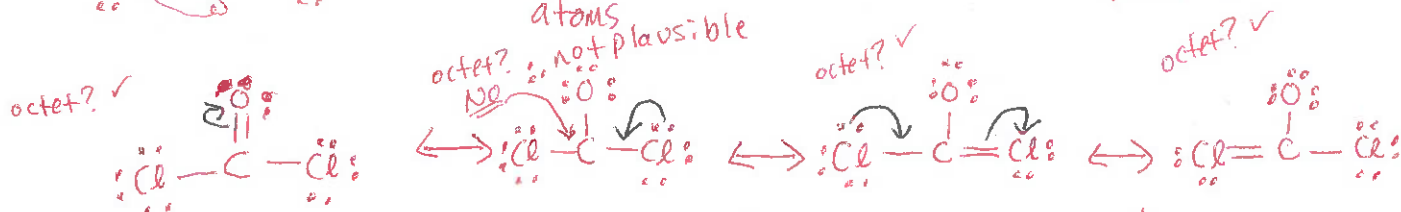
3. Draw three plausible resonance structure of COCl_2 , rationalize which should be most dominant.



↓
move
e⁻s
not
atoms
not plausible

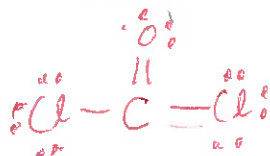
4 2 1
central atom

*make a bond you have to break
a bond*

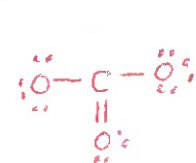
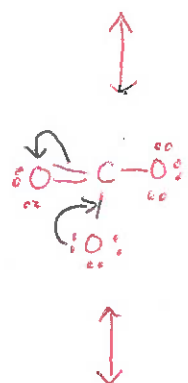
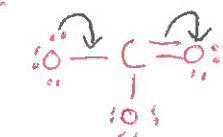


		Cl _{left}	C	O	Cl _{right}		Cl _{left}	C	O	Cl _{right}		Cl _{left}	C	O	Cl _{right}
valence e ⁻ s	V	7	4	6	7		7	4	6	7		7	4	6	7
bonding e ⁻ s	B	$\frac{1}{2}(2)=1$ $\frac{1}{2}(2)=1$ $\frac{1}{2}(4)=2$ $\frac{1}{2}(2)=1$					$\frac{1}{2}(2)=1$ $\frac{1}{2}(2)=1$ $\frac{1}{2}(4)=2$ $\frac{1}{2}(2)=1$					$\frac{1}{2}(2)=1$ $\frac{1}{2}(2)=1$ $\frac{1}{2}(4)=2$ $\frac{1}{2}(2)=1$			
non-bonding e ⁻ s	NB	6	0	4	6		6	0	6	4		4	0	6	6
formal charge	F.C.	0	0	0	0		0	0	-1	+1		+1	0	-1	0

most dominant b/c
least charged &
all have an octet
(formal charges)
closest to zero

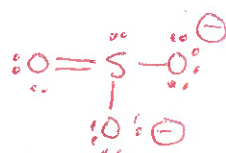
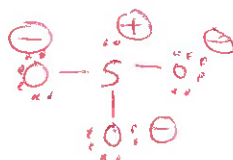


4. Determine and draw all plausible resonance structures for CO_3^{2-} and SO_3^{2-} , which, if any, is dominant?



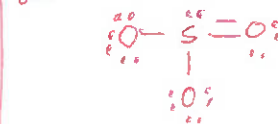
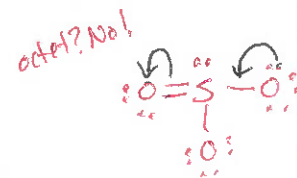
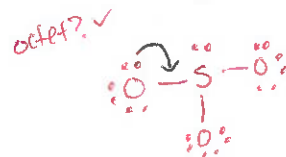
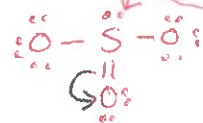
all the same in terms of
F.L. & octet so
equally dominant

must satisfy b/c in 1st two periods ok P.T.



more dominant
b/c minimize
charge & b/c
can exceed
octet b/c
below 2nd two
rows.

add 2 e⁻
central
lower in P.T. ∴ central



octet? No!

	O	L	O	S	O	R
V	6	6	6	6	6	6
-B	1/2(6)	1/2(6)	1/2(6)	1/2(6)	1/2(6)	1/2(6)
-N	6	4	3	3	4	6
F.L.	-1	0	0	-1		

* minimize F.L. (close zero)
* isom more EN element

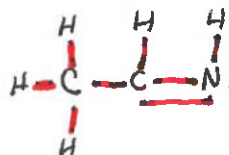
	O	L	O	S	O	R
V	6	6	6	6	6	6
-B	1/2(6)	1/2(6)	1/2(6)	1/2(6)	1/2(6)	1/2(6)
-N	6	6	3	3	6	6
F.L.	-1	-1	+1	-1		

5. Additional Practice: Draw the Lewis dot structures of all the polyatomic ions. Which can have plausible resonance structures?

Deciphering more complex structures



- draw out non-H 1st in order written
- place Hs around nearest atom written
- connect e⁻ (draw bonds)



indicates oxygen double bond
(i.e. C=O)

